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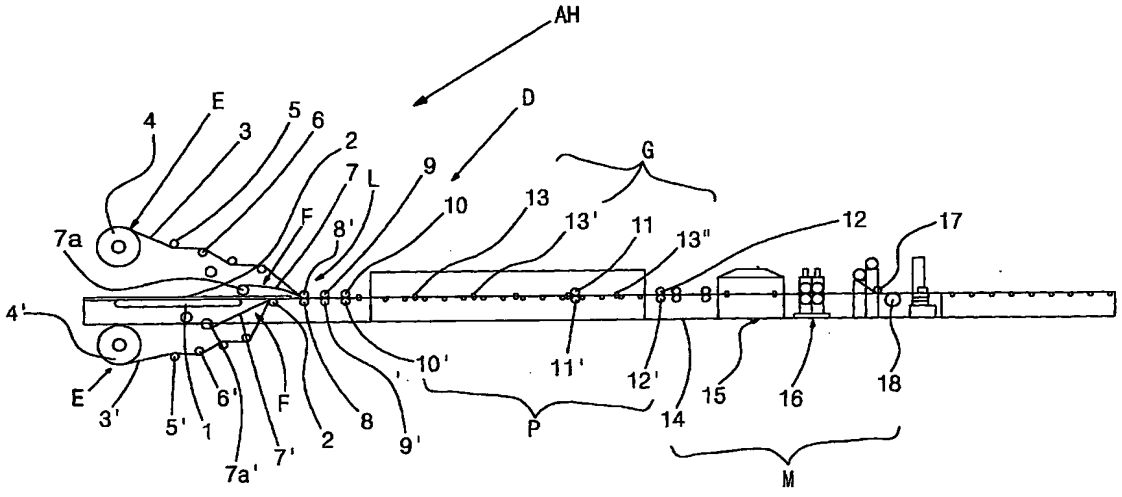
(54) Title: CONTINUOUS MANUFACTURING SYSTEM FOR COMPOSITE ALUMINUM PANELS




(57) Abstract: A continuous manufacturing system for composite aluminum panels comprises a continuous expanding device (CE) for expanding a raw material of a core and a main body (AH) of a continuous manufacturing system of composite aluminum panels. The continuous expanding device (CE) consists of a cramp (21) for holding raw material (2a), a raw material supplier (S), a number of sliding rods (31) for sliding raw material (2a) and the core (2), subsidiary cramp (22) that reciprocates from side to side and is ascended and is descended on racks (37, 37'), a cramp (23) for expanding a raw material and a roller (25) running idle transferring to the main body (AH). The main body (AH) consists of supplying part (E) for providing top and bottom aluminum plates (3, 3'),a supplying part (F) for providing adhering materials, a combination part (L) comprising the upper and lower rollers (8, 8') and a hot pressing part (P) comprising rollers (10, 10', 11, 11', 12, 12') for hot pressing and supporting.

WO 2004/098884 A1

# Continuous manufacturing system for composite aluminum panels.

## Techinical Field

The present invention relates to a system manufacturing composite aluminum panels continuously by using metal(aluminum) cores being expanded continuously in manufacture of composite aluminum panels.

## Background Art

Up to now, for manufacture composite aluminum panels inserted honeycomb cores, honeycomb type metal(hereinafter refer to as aluminum) cores are expanded in a certain length by a manual expanding device, hot-melt film layers are put on the upper and the lower sides of the expanded cores and on the film layers aluminum plates are put, the reaulting objects are pressed in hot presses, to give composite aluminum panels.

But in this case expanding devices of aluminum cores should be operated manually and thus the cores can not expanded continuously.

Accordingly the standardized panels can not be manufactured continuously.

Now, referring to the accompanying drawings, a method for expanding

cores for composite aluminum panel by the conventional device for expanding cores and a conventinal process for preparing panels by using the expanded cores will be described as follows ;

As shown in Fig 5, a fixing part Fa fixing a left end of pre-expanded raw material 1001 for honeycomb type cores comprising a supporter 300 fixed on the upper one side of a base 200, a number of air pressure cylinders 400 ascending and descending on said supporter 300, a stair type bracket 600 fixed on the lower ends of rods 500 of said cylinders 400, a holding rod 900 for taking needle rods 700 mounted on said bracket 600 and having a number of holes 800 capable of inserting and drawing needle rods 700 for fixing on a number of holes 1002 of honeycomb type cores ; a transferring part R comprising the supporter 300, a number of the air pressure cylinder 400, the stair type bracket 600 and a holding rod 900 for taking needle rods having a number of inserting and drawing holes 800 identical to those of said fixing part Fa, and a pinion gear(not shown in Figs) established on the lower end of said supporter 300, engaging with a rack 1003 established on the upper both sides of said base 200 to transfer right and left ; and plate 100 for expanding the honeycomb type core formed between said fixing part Fa and transferring part R.

But to manufacture the expanded honeycomb type cores from raw material

for core by said conventional device for expanding honeycomb type core, after a number of needle rods 700 are inserted perpendicularly in said inserting and drawing holes 800 for the needle rods of said fixing part Fa manually, by means of ascent and descent of ascending and descending cylinder 400 the bracket 600 fixed on the lower part of the cylinder is gone up and come down to ascend and descend the holding rod 900 for taking needle rods 700 fixed on the bracket 600, and by means of ascent and descent of the holding rod 900 the lower ends of the needle rods 700 inserted in the inserting and drawing holes 800 of the holding rod 900 are fixed, by means of inserting, in the holes 1002 of the honeycomb type core expanded partially in left end of raw material for the honeycomb type core. At this time, by means of the pinion gear(not shown in Figs) fixed on the lower end of the transferring part R engaged with the rack established on the upper both sides of the base 200, the transferring part R is transferting manually to lie adjacent to said fixing part Fa, then the lower ends of the needle rods 700 inserted in the inserting and drawing holes 800 for needle rods of the holding rod 900 fixed on the transferring part R are inserted in the holes 1002 of the honeycomb type core expanded partially(manually) of the right end of the raw material(core-raw material) 1001 for the honeycomb type core and the transferring part R is transferred manually in

the right direction to give expanded honeycomb type core from the raw material 1001 for the honeycomb type core.

However, in said conventional device, the needle rods 700 for taking the core-raw material 1001 should be inserted manually in the inserting and drawing holes 800 for needle rods, the transferring part R also should be transferred manually in right and left, length and width of the honeycomb type core manufactured by said device also are restricted, that is, in one device cores having restricted length and width only are manufactured.

Accordingly this device has faults that various sorts of cores having different length and width cannot be made.

Furthermore, in manufacturing composite aluminum panels by using honeycomb type cores expanded by this device because all of honeycomb type cores, hot melting films and aluminum plates as raw materials for manufacturing the panel should be layered only manually, the raw materials cannot be layered in the same mode.

Accordingly by means of the above-mentioned conventional device standardized articles cannot be produced and also long and large panels cannot be produced continuously.

## Disclosure of Invention

The present invention relates to continuous manufacturing system for composite aluminum panels characterized in that honeycomb type core as medium material for manufacturing a composite aluminum panel can be expanded continuously and automatically to give expanded honeycomb cores, the expanded honeycomb type core can be provided together with hot melting films and aluminum plates continuously and automatically to give the composite aluminum panel, thickness of the panel can be adjusted automatically by a roller for controlling the thickness and a hot pressing roller, width of the panel can be adjusted automatically by a device supporting left and right sides, the resulting composite aluminum panel is passed through, in sequence, rapid and slow cooling devices, a pinch roller, a roller adhering protecting tapes and side cutters to give, continuously and in great quantities, various length of composite aluminum panels having uniform thickness and width inserted honeycomb type cores.

Now, the continuous manufacturing system of the present invention will be described in detail referring to the accompanying drawings in below.

## Brief Description of the Drawings

Fig1 represents a general schematic elevation of a system in accordance with the present invention.

Fig2 represents a schematic elevation of continuous expanding device in accordance with the present invention.

Fig3 represents a general perspective view of a continuous expanding device in accordance with present invention.

Fig4 represents an illustration view showing expanding state utilized a continuous expanding device of the honeycomb type core in accordance with the present invention.

Fig5 represents an illustration view of a conventional expanding device for a honeycomb type core.

## Best Mode for Carrying out the Invention.

A continuous manufacturing system for composite aluminum panels of the present invention is comprised of a continuous expanding device CE for expanding a honeycomb type core for a composite aluminum panel and a main body AH of a continuous manufacturing system of composite aluminum panels having honeycomb type cores.

In said continuous manufacturing system of composite aluminum panels

having honeycomb type cores said continuous expanding device CE for the core consists of a cramp 21 for holding raw material 2a before expansion(pre-expanding) for manufacturing a honeycomb type core which ascends and descends by means of perpendicular cylinders 33,33' and reciprocates from side to side on racks 37,37' established on the upper part of a main body B by means of a cylinder 27 that the outer end is mounted on perpendicular plate 10 of said main body B; a raw material supplier S that a pusher 29 for pushing raw material having a number of U type grooves 29' in a certain space is fixed on the right upper end of ㄷ type brackets 20,20' which mounted on the perpendicular plate 10 fixed on the upper end of the main body B and reciprocated from side to side by means of cylinders 28,28' connected with lower ends of said brackets; a number of sliding rods 31 for sliding raw material 2a for the core and the core 2 that their positions are controlled in front and in the rear by means of a centering handle 32 connected with the front side of the most outer rod of their rods 31 and their right and left ends are mounted on the grooves 29' of said pusher 29 and on length-wise supporter 30 equipped under a transferring roller 25 which mounted on the right end of the expanding device CE, respectively; a subsidiary cramp 22 that reciprocates from side to side on racks 37,37' by means of a cylinder(not shown in Figs) and

simultaneously is ascended and is descended by means of perpendicular cylinders 34,34′ to hold fixedly the right side of the core near said cramp 21 for holding raw material when said cramp 21 for holding is transferred to the left as much as intended width for expanding raw material 2a to hold the left side of the raw material 2a; a cramp 23 for expanding a raw material for a core that reciprocates from side to side by means of a cylinder(not shown in Figs) and ascends and descends by means of perpendicular cylinders 35,35′, wherein the pre-expanded right end of the raw material 2a for the core that the left end thereof is held by said cramp 21 for holding, is held by means of said expanding cramp 23 to expand it to the right side of side main body B of the expanding device CE; a transferring roller 25 running idle for transferring an expanded core that situates at the right end of the main body B and transfers said expanded honeycomb type core 2 to a middle conveyer 1 of a combination part L in a main body AH of a continuous manufacturing system for composite aluminum panels.

In the continuous manufacturing system for the composite aluminum panels having honeycomb type cores said main body AH consists of suppling part E for providing top and bottom aluminum plates 3,3′ passing through rollers 5,5′,6,6′....from the upper and lower roles 4,4′ on the upper and lower sides

of said expanded honeycomb type core 2 being supplied from said continuous expanding device CE for the core; suppling part F for providing adhering materials by means of any one device selected from a device for providing hot-melt films 7,7′ as an adhering material, being melted by hot press of a hot pressing part P as a post-process, from roles 7a,7a′ for providing films between said expanded honeycomb type core 2 and the upper and lower aluminum plates 3,3′, an applicator (not shown in Figs) spraying hot melting thermoplastic resin adhesive made from any one of thermoplastic resins such as polyethylene, polyisobutylene, polyamide, ethylene vinyl acetate copolymer, polyurethane, or a device(not shown in Figs) for spraying liquid thermosetting resin adhesive made from any one of thermosetting resins such as epoxy or phenol resin; a combination part L comprising the upper and lower rollers 8,8′ for combinating aluminum plates 3,3′, adhering materials and the expanded core 2, providing from said suppling parts and device; a hot pressing part P comprising upper and lower rollers 10,10′,11,11′,12,12′ for hot pressing and supporting; a finishing part M comprising a quick cooling apparatus 14, a slow cooling apparatus 15, an adhering roller 17 for protecting tape, a side cutter 18 for cutting sides of molded panel and a roller 16 for pinching the completed panel, established in sequence behind said hot pressing part P to finish said

completed composite aluminum panel having the honeycomb type core.

Futhermore, between, before or behind the combination part L and the hot pressing part P, thickness controlling part D consisting of rollers 9,9' for controlling thickness and a side supporting part G consisting of apparatuses 13,13',13" for supporting sides of the completed panel may be established.

To manufacture the composite aluminum panel having honeycomb type cores, utilizing the continuous manufacturing system for the composite aluminum panels of the above-mentioned present invention, first of all, as shown in Figs2,3 and 4, the honeycomb type core is expanded continuously utilizing the continuous expanding device CE of the honeycomb type core for the composite aluminum panel as follows;

The cramp 21 for holding raw material 2a is transferred to the right pre-set position by means of the operation of the cylinder 27 for operating said cramp 21 and simultaneously the subsidiary cramp 22 also is transferred to lie adjacent said cramp 21, a bundle of raw material 2a for honeycomb type core adhered each other a number of units of the raw material 2a by means of an adhesive or double-faced adhesive tape is put on a number of the sliding rods 31 of the raw material supplier S for the core, first, the cramp 21 for holding raw material and the subsidiary cramp 22 are ascended by means of the perpendicular cylinders 33,33',34,34', then

the raw material 2a for the core is pushed to the right side using the pusher 29 which fixed on the right upper end of the brackets 20,20' and operated by means of cylinders 28,28' of the raw material supplier S for the core so that the raw material 2a for the core is projected as much as width pre-set to expand to the right side of said cramp 21 for holding raw material and the subsidiary cramp 22, after said cramp 21 for holding is descended by means of the perpendicular cylinders 33,33' to hold the left side of the raw material 2a for the core, the ascended expanding cramp 23 is transferred to the left side on the rack gears 37,37' by means of the cylinder (not shown in Fig) and then the expanding cramp 23 is descended by means of the perpendicular cylinders 35,35' to hold the right side of said raw materials for the core, and the resulting cramp 23 held raw material 2a for the core is transferred to the transferring roller 25 on the main body B of the continuous expanding device CE to give a standardized honeycomb type core.

Furthermore, in order to that said expanded honeycomb type core is manufactured continuously and composite aluminum panels having the honeycomb type core are manufactured with the resulting honeycomb type core continuously, a continuous manufacturing process is repeated as follows;

Said expanding cramp 23 completed the expansion of the core in a certain length is ascended by means of the perpendicular cylinders 35,35', the subsidiary cramp 22 is descended by means of the cylinders 34,34' to hold core expanded to the right side of the cramp 21 for holding, after the cramp 21 for holding is ascended by means of the cylinders 33,33' to transfer to the left side of the raw material 2a as much as width pre-set to expand, in identical method to the above-mentioned process the cramp 21 for holding is descended to hold raw material 2a for the core, the subsidiary cramp 22 is ascended, said ascended expanding cramp 23 is transferred to the left side and then is descended to hold the expanded core adjacent to the subsidiary cramp 22, and the expanding cramp 23 held the right of the expanded core is transferred to the right transferring roller 25 to give continuously the honeycomb type core expanded completely and the resulting expanded honeycomb type core is provided continuously the main body AH of the continuous manufacturing system for the composite aluminum panels.

On the upper and lower sides of the honeycomb type core provided from said continuous expanding device, as shown in Fig 1, aluminum plates 3,3' are provided passing through rollers 5,5',6,6' from the upper and lower rolls 4,4' of the suppling part E for providing aluminum plates and

simultaneously between said expanded honeycomb type core and aluminum plates, any one of adhering material selected from hot-melt films, hot melting thermoplastic resin adhesive or liquid thermosetting resin adhesive provided from the suppling part F for providing adhering materials is provided (in the mode of the present invention the hot-melt films 7,7′ are provided from roles 7a,7a′ for providing film), the combined body consisting of the honeycomb type core, the adhering material and aluminum plates is passed through the combination rollers 8,8′ of the combination part L pinching by means of the roller 16 for pinching the combined body for the composite aluminum panel to maintain it tightly, wherein in case that the thickness controlling part D is established in this system said combined body as a composite aluminum panel is passed through the thickness controlling rollers 9,9′ to control in a certain thickness, then the resulting composite aluminum panel is passed through the hot-pressing part P to control the its thickness twice by means of hot-pressing, also in case that the side supporting part G is established in this system the width of the composit aluminum panel is maintained regularly by means of the side supporting apparatuses 13,13′,13″ of the side supporting part G, and then the cooling processes by means of the quick and slow cooling apparatuses 14,15, the adhering process of protecting tape by means of adhering roller 17 for

adhering protection tape and the cutting process cutting by means of the cutter 18 the resulting panel in a certain length is carried out, in sequence, to give a certain length of the completed composite aluminum panels.

## What is claimed is ;

1. A continuous manufacturing system for composite aluminum panels comprising a continuous expanding device CE for expanding raw material of a core consisting of a cramp 21 for holding raw material 2a before expansion(pre-expanding) for manufacturing a honeycomb type core, a raw material supplier S that a pusher 29 for pushing raw material having a number of U type grooves 29′ in a certain space is fixed on the right upper end of ㄷ type brackets 20,20′, a number of sliding rods 31 for sliding raw material 2a for the core and the core 2, a subsidiary cramp 22 that reciprocates from side to side on racks 37,37′ by means of a cylinder(not shown in Figs) and simultaneously is ascended and is descended by means of perpendicular cylinders 34,34′, a cramp 23 for expanding a raw material for the core that reciprocates from side to side by means of a cylinder(not shown in Figs) and ascends and descends by means of perpendicular cylinders 35,35′, a transferring roller 25 running idle for transferring an expanded core that situates at the right end of the main body B; and a main body AH of a continuous manufacturing system for composite aluminum panels consisting of a suppling part E for providing top and bottom aluminum plates 3,3′, passing through rollers 5,5′,6,6′... from the upper and lower rollers 4,4′ on the upper and lower sides of said expanded

honeycomb type core 2, suppling part F for providing adhering materials, a combination part L comprising the upper and lower rollers 8,8', a hot pressing part P comprising upper and lower rollers 10,10',11,11',12,12' for hot pressing and supporting, a finishing part M comprising a quick cooling apparatus 14, a slow cooling apparatus 15, an adhering roller 17 for protecting tape, a side cutter 18 for cutting sides of completed panel and roller 16 for pinching the completed panel established in sequence behind said hot pressing part P.

2. A continuous manufacturing system for composite aluminum panels in accordance with claim 1 in which said cramp 21 comprises perpendicular cylinders 33,33' for ascending and descending the cramp 21, a cylinder 27 for reciprocating from side to side it on racks 37,37' established on the upper part of a main body B and its outer end is mounted on perpendicular plate 10 of said main body B.

3. A continuous manufacturing system for composite aluminum panels in accordance with claim 1 in which said raw material supplier S is mounted on the perpendicular plate 10 fixed on the upper end of the main body B and reciprocated from side to side by means of cylinders 28,28' connected with lower ends of said brackets.

4. A continuous manufacturing system for composite aluminum panels in

accordance with claim 1 in which the front side of the most outer rod of said a number of sliding rods 31 for sliding raw material 2a for the core and the core 2 are connected with a centering handle 32 controlling their positions in front and in the rear and their right and left ends are mounted on the grooves 29′ of said pusher 29 and on length-wise supporter 30 equipped under a transferring roller 25 which mounted on the right end of the expanding device CE, respectively.

5. A continuous manufacturing system for composite aluminum panels in accordance with claim 1 in which said suppling part F for providing adhering materials comprises any one device selected from a device for providing hot-melt films 7,7′ from roles 7a,7a′ for providing film, an applicate(not shown in Figs) spraying hot melting thermoplastic resin adhesive and a device(not shown in Figs) for spraying liquid thermosetting resin adhesive.

6. A continuous manufacturing system for composite aluminum panels in accordance with claim 5 in which said hot melting thermoplastic resin adhesive made from any one of thermoplastic resins selected from polyethylene, polyisobutylene, polyamide, ethylene vinyl acetate copolymer and polyurethane.

7. A continuous manufacturing system for composite aluminum panels in

accordance with claim 5 in which said liquid thermosetting resin adhesive made from any one of thermosetting resins selected from epoxy or phenol resin.

8. A continuous manufacturing system for composite aluminum panels in accordance with claim 1 in which between, before or behind the combination part L and the hot pressing part P, thickness controlling part D consisting of rollers 9,9′ for controlling thickness and a side supporting part G consisting of apparatuses 13,13′,13″ for supporting sides of the completed panel be established.

Fig 1

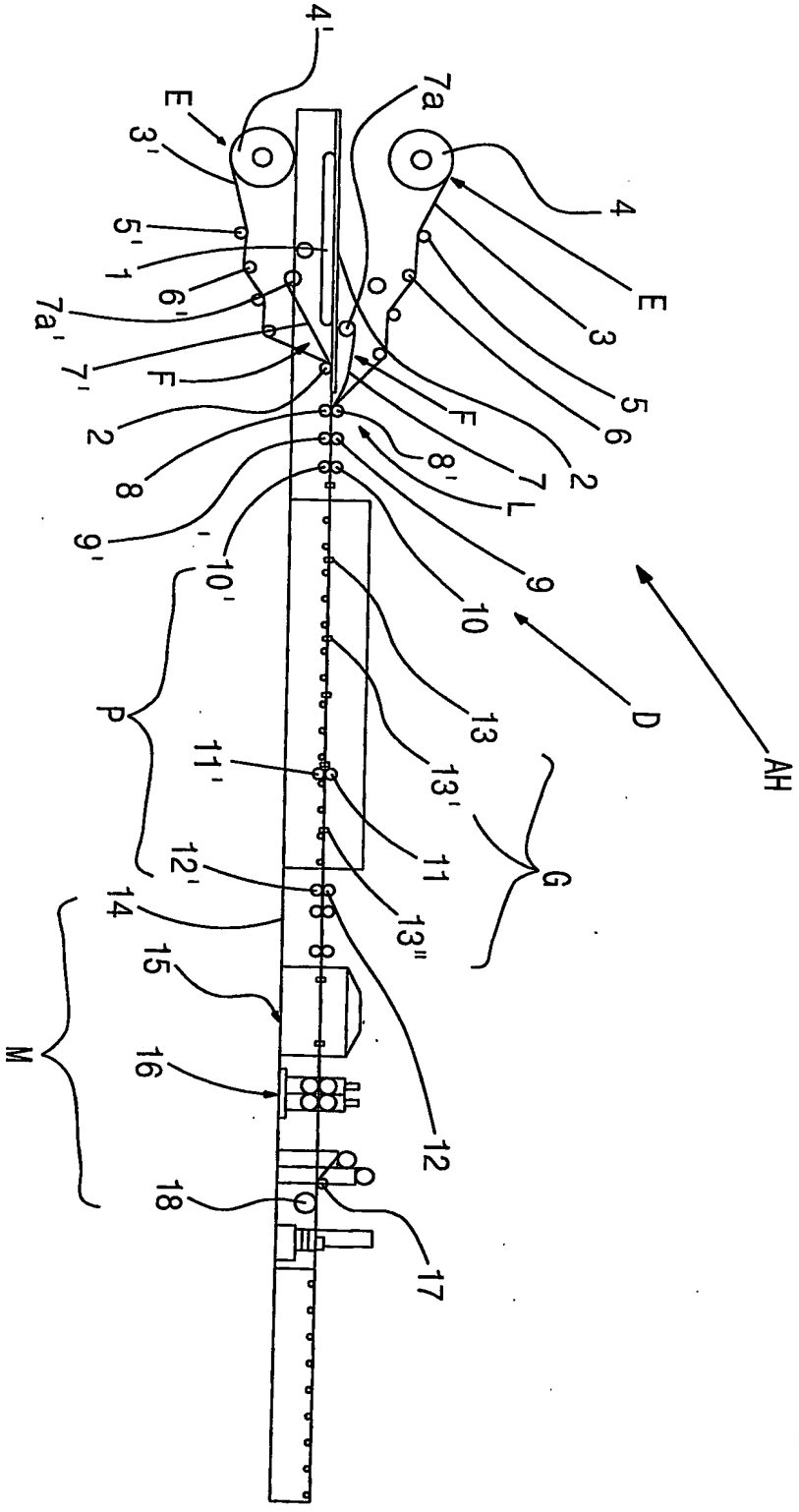

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Fig 2

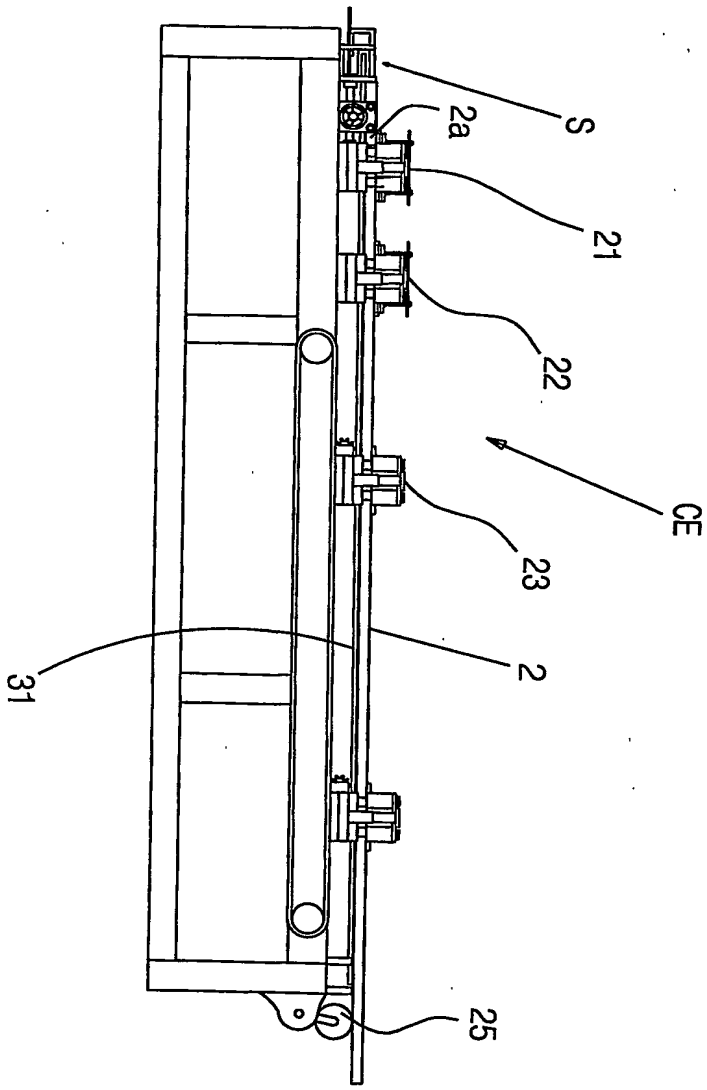

Fig 3

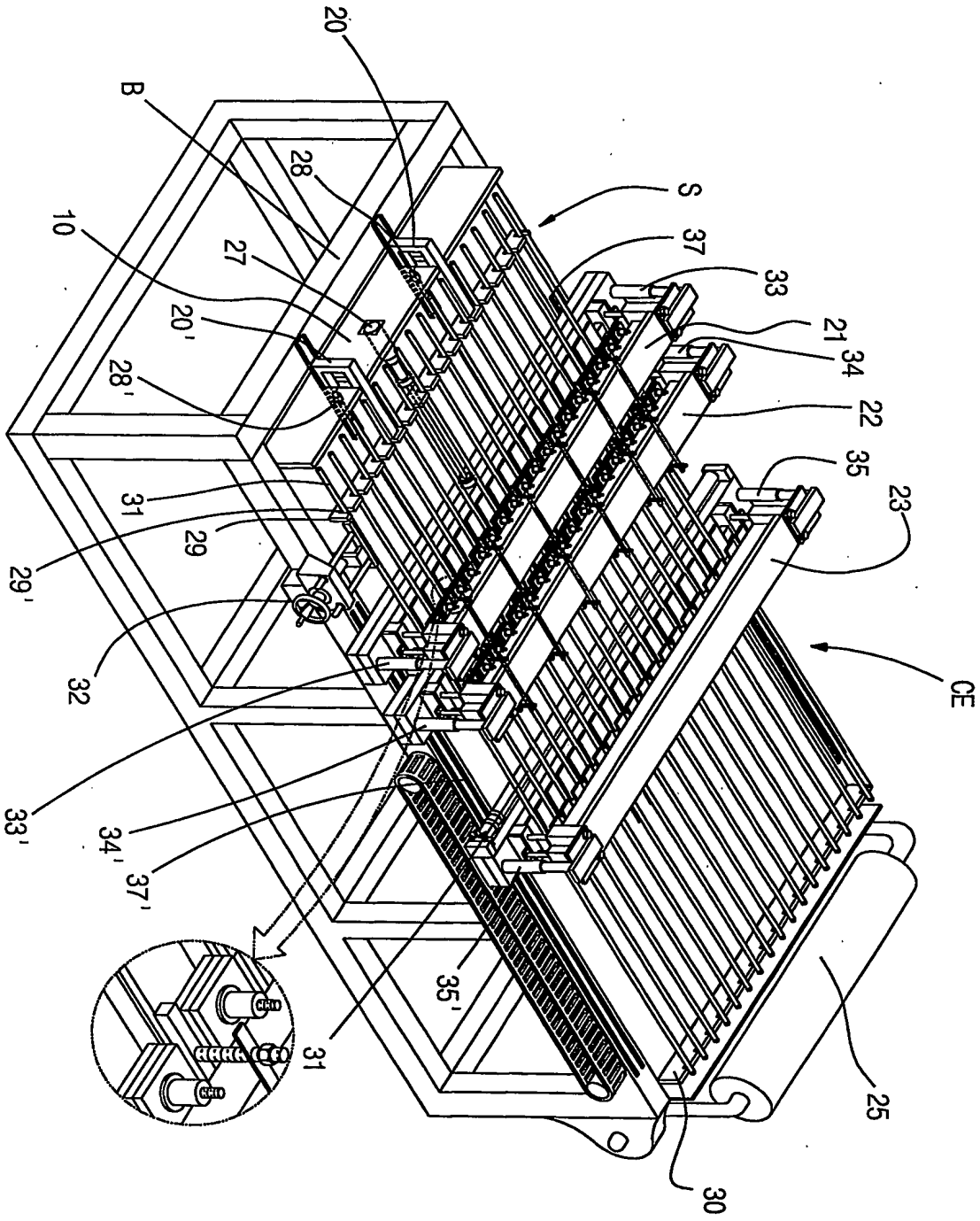
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Fig 4

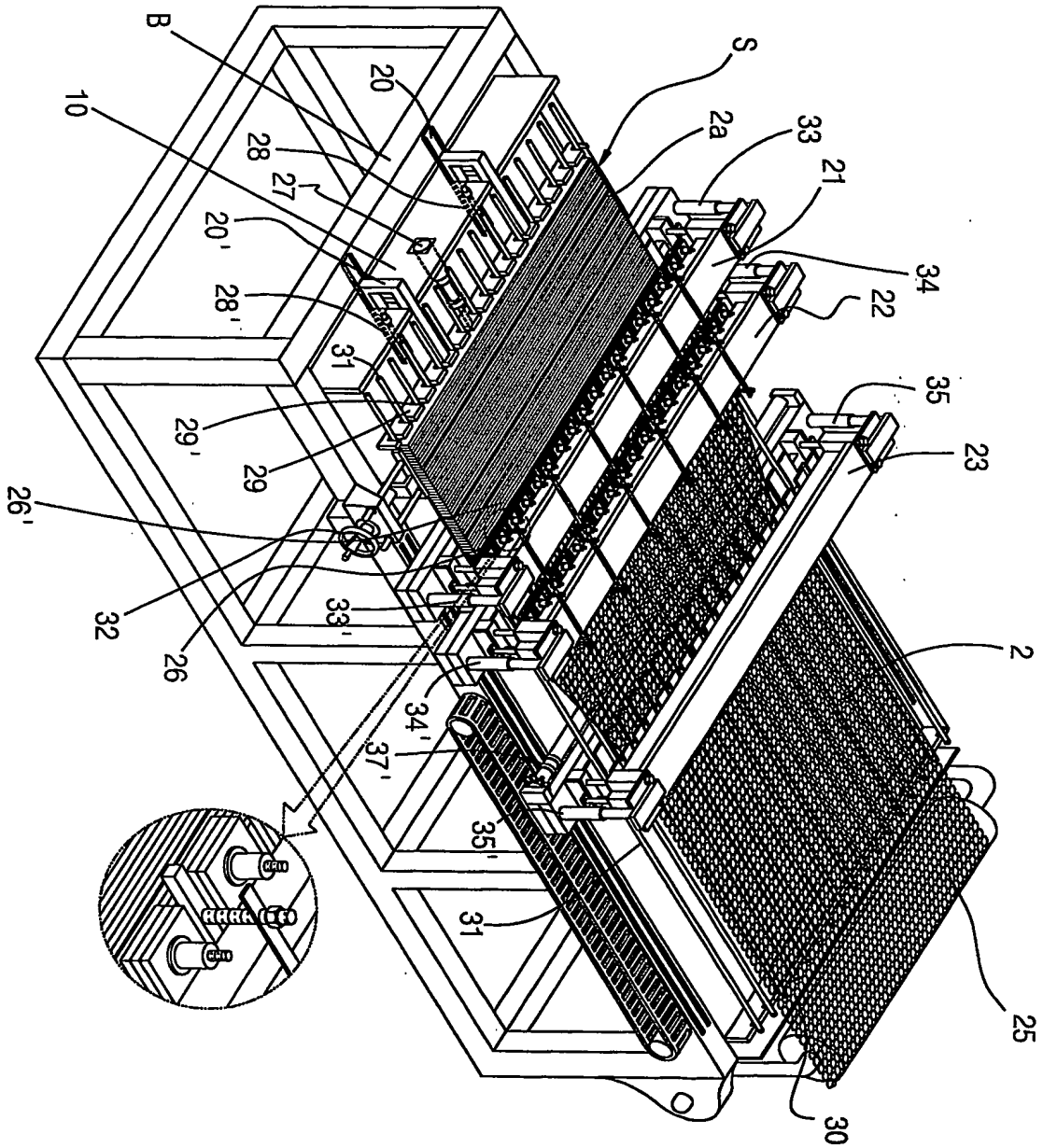
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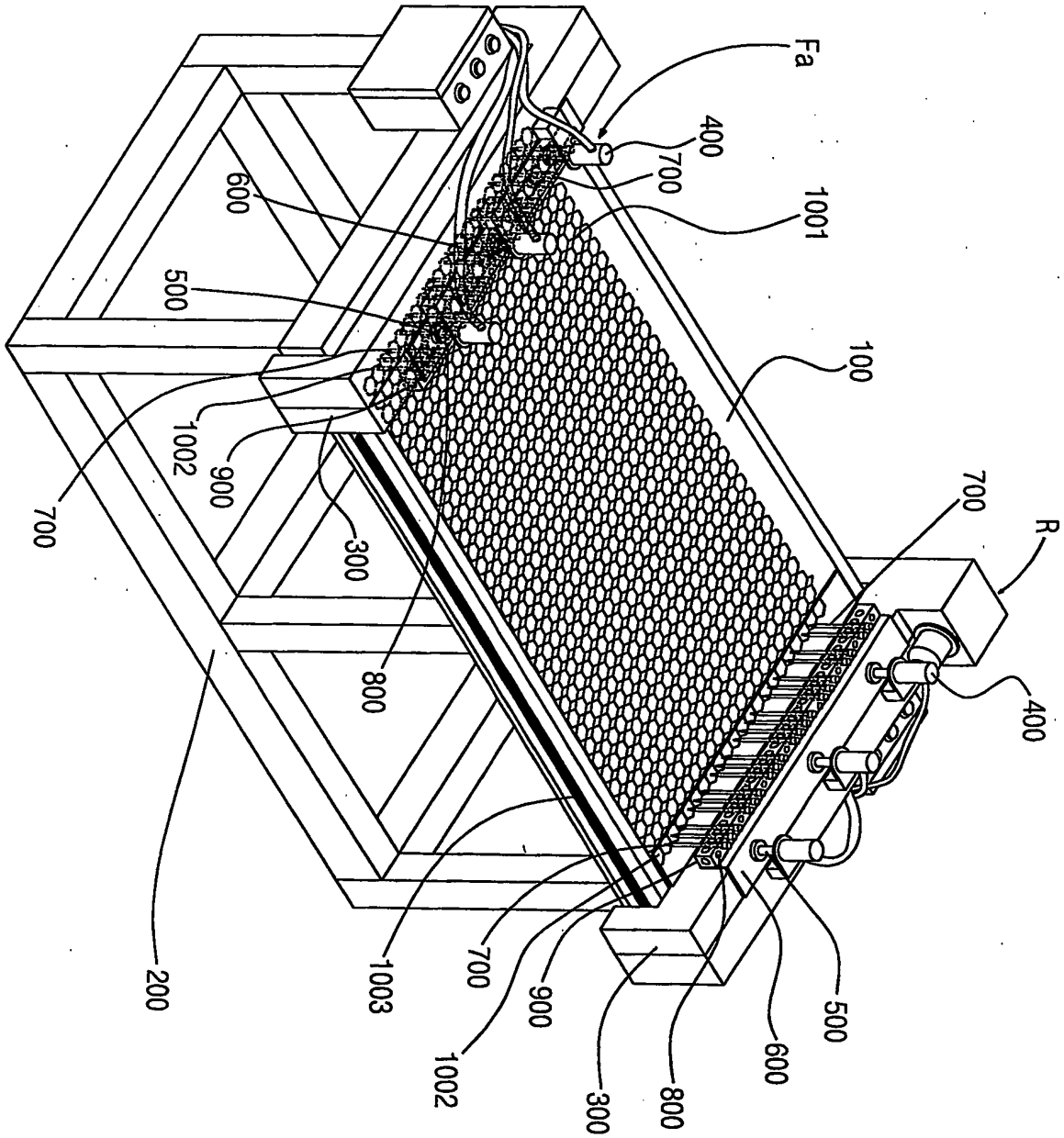
Fig 5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# INTERNATIONAL SEARCH REPORT

International Application No.
PCT/KR 03/01618-0

CLASSIFICATION OF SUBJECT MATTER

IPC[7]: B32B 31/00; B32B 15/08; B32B 15/20; B32B 3/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC[7]: B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

AT-B

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EODOC; WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| A | EP 0624459 A2 (CIBA-GEIGY) 17 November 1994 (17.11.94) *examples; claims; figures.* | 1-8 |
| A | EP 087546 A2 (Schweizerische Aluminium AG) 7 September 1983 (07.09.83) *claims; figures.* | 1-3 |
| A | GB 2227449 A(Kingspan Research And Development Limited) 1 August 1990 (01.08.90) *figures; claims.* | 1-3 |

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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 28 January 2004 (28.01.2004) | 11 March 2004 (11.03.2004) |
| Name and mailing adress of the ISA/AT<br>Austrian Patent Office<br>Dresdner Straße 87, A-1200 Vienna<br>Facsimile No. 1/53424/535 | Authorized officer<br>TENGLER E.<br>Telephone No. 1/53424/213 |

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Information on patent family members

International application No.
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